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September 05, 2004

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APPLICATION NUMBER: *60/478,791*
FILING DATE: *June 16, 2003*
RELATED PCT APPLICATION NUMBER: *PCT/US04/18644*

Certified by

Jon W Dudas

Acting Under Secretary of Commerce
for Intellectual Property
and Acting Director of the U.S.
Patent and Trademark Office

06-17-3

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. ET 567902411 US

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
STEVE C.	BENESI	611 McCLAY ROAD NOVATO CA 94947

☐ Additional inventors are being named on the _____ separately numbered sheets attached hereto

TITLE OF THE INVENTION (500 characters max)

SLURRY FILTRATION SYSTEM AND APPARATUS

Direct all correspondence to: CORRESPONDENCE ADDRESS

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☒ Firm or Individual Name	GEORGE W. WASSON				
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Address					
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Country	USA	Telephone	(925) 283-4420	Fax	(925) 283-4420

ENCLOSED APPLICATION PARTS (check all that apply)

- ☒ Specification — Number of Pages: 9
- ☒ Drawing(s) — Number of Sheets: 2
- ☐ Application Data Sheet. See 37 CFR 1.76
- ☐ CD(s), Number
- ☐ Other (specify)

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

- ☒ Applicant claims small entity status. See 37 CFR 1.27.
- ☒ A check or money order is enclosed to cover the filing fees
- ☐ The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: [ ]
- ☐ Payment by credit card. Form PTO-2038 is attached.

FILING FEE AMOUNT ($): 80.00

The Invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____

Respectfully submitted,

SIGNATURE George W. Wasson

Date 6-16-03

TYPED or PRINTED NAME GEORGE W. WASSON

REGISTRATION NO. (if appropriate) 17,685

TELEPHONE (925) 283-4420

Docket Number: SLB-03-4AA

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. The information is used by the public to file (and by the PTO to process) a provisional application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the complete provisional application to the PTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Box Provisional Application, Assistant Commissioner for Patents, Washington, D.C. 20231.

[redacted]

60473791.061603

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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	TO BE ASSIGNED
Filing Date	TO BE ASSIGNED
First Named Inventor	STEVE C. BENESI
Group Art Unit	
Examiner Name	
Total Number of Pages in This Submission: 14	Attorney Docket Number: SCB-03-4-PA

ENCLOSURES *(check all that apply)*

- [X] Fee Transmittal Form
  - [X] Fee Attached
- [ ] Amendment / Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Assignment Papers *(for an Application)*
- [X] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) _____
- [ ] After Allowance Communication to Group
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to Group *(Appeal Notice, Brief, Reply Brief)*
- [ ] Proprietary Information
- [ ] Status Letter
- [X] Other Enclosure(s) *(please identify below)*: PROVISIONAL PATENT APPLICATION

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	GEORGE W. WASSON
Signature	George W. Wasson
Date	June 16, 2003

CERTIFICATE OF MAILING

EXPRESS MAIL ET567902441 US

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Signature	George W. Wasson	Date	6-16-03

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FEE TRANSMITTAL for FY 2003

Patent fees are subject to annual revision.

☒ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 80.00

Complete if Known	
Application Number	TO BE ASSIGNED
Filing Date	TO BE ASSIGNED
First Named Inventor	STEVE C. BENESI
Examiner Name	
Art Unit	
Attorney Docket No.	SCB-03-4-PA

METHOD OF PAYMENT *(check all that apply)*

☒ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	740	2001	370	Utility filing fee	
1002	330	2002	165	Design filing fee	
1003	510	2003	255	Plant filing fee	
1004	740	2004	370	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	80.00

SUBTOTAL (1) ($) 80.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

	Extra Claims		Fee from below	Fee Paid
Total Claims		-20** =	X	=
Independent Claims		-3** =	X	=
Multiple Dependent				=

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple dependent claim, if not paid
1204	84	2204	42	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($)

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	400	2252	200	Extension for reply within second month	
1253	920	2253	460	Extension for reply within third month	
1254	1,440	2254	720	Extension for reply within fourth month	
1255	1,960	2255	980	Extension for reply within fifth month	
1401	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	
1403	280	2403	140	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,280	2453	640	Petition to revive - unintentional	
1501	1,280	2501	640	Utility issue fee (or reissue)	
1502	460	2502	230	Design issue fee	
1503	620	2503	310	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	740	2809	370	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	740	2810	370	For each additional invention to be examined (37 CFR 1.129(b))	
1801	740	2801	370	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	
Other fee (specify)					

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SUBMITTED BY

Name (Print/Type)	GEORGE W. WASSON	Registration No. (Attorney/Agent)	17,685	Telephone (925) 283-4420
Signature	George W. Wasson			Date 6-16-03

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SLURRY FILTRATION SYSTEM AND APPARATUS

Slurries of solids and liquids produced in many manufacturing processes require separation of the liquids and solids to produce a desired product or products; the product may be either or both the liquid or the solid part of the slurry. Efficiency in accomplishing the separation and the quality of the separated liquid or solid with the least amount of equipment is the objective of many separating systems. Efficiency in the separation system is dependent upon the time taken to accomplish the separation as well as the amount of utilities and space needed for the system and the need for multiple pieces of equipment to accomplish the separation and quality of separated product The present invention is directed to a system and apparatus for efficiently separating liquids from solids in a slurry stream with a minimum of equipment and with the use of a limited amount of space and utilities while producing the desired end product of a liquid and/or solid product.

Prior art separating systems have used centrifugal mechanisms for separating liquids and solids followed by rotary, flash, fluid bed, or belt dryers for producing a product. Others have used diaphragm membrane filters that press liquids from solids followed by drying processes for drying the solids. Other filters of the design of the present inventor use a pressure filter that includes a filter chamber that distributes a slurry within the chamber and follows the filling with liquid or fluid introductions to the chamber to force the separation of the liquids from the chamber to leave a solids filter cake of a desired form.

The present invention is a system using the filter apparatus previously disclosed by the present inventor along with peripheral elements for conditioning the slurry prior to entry into the filter apparatus and the control of fluid and liquid introduction into the filter apparatus to produce a product of desired quality. The system includes a controller for sequentially controlling the operation of the peripheral equipment, for the introduction of the treated or conditioned slurry into the filter apparatus, and the control of additional peripheral equipment for treatment of the slurry within the chamber for the production of both desired

liquids and solids from the filter apparatus in a form desired for the process involved.

The attached figures illustrate the overall system 10 in block diagram form; the system of the present invention includes a filter apparatus and the peripheral apparatus used to perform the method of the system. FIG. 1 illustrates an input slurry stream at 12 followed by analytical equipment14 for measuring selected characteristics of the slurry stream. The results of the analysis of the characteristics of the slurry stream are passed to a controller 16 where a central control of several peripheral pieces of equipment are to be controlled. The slurry stream then passes to a heat source 18 where the temperature of the slurry is maintained and/or controlled in accord with a preprogrammed specification for the system. The slurry then passes to a pH measuring and adjusting apparatus 20 where that characteristic of the slurry is measured and adjusted if needed under control of the controller 16. For purposes that will be later discussed, the slurry stream is them combined with coagulants from coagulant source 22, polymers from polymer source A 24 and/or from polymer source B 26 or from additional sources of additives as needed. A simplified version may only require a single additive (such as polymer) introduction upstream of he filter. The slurry stream then passes to a slurry conditioning stage 28 including a mixer 30 for preparing the slurry for feed to a filter apparatus 32,as shown in Fig.2.

The filter apparatus and its peripheral equipment of the system 10 is illustrated in block diagram Fig. 2. The filter apparatus 32 includes a slurry input port, an upper plate 36, a lower plate 38 that together form a filter chamber 40, and a filter media 42 between the upper and lower plates. The filter media is a porous filter belt that passes through the chamber when the plates are separated, collects the solids of the prepared input slurry 22 when the filter is operated with the plates closed, and carries the collected filter cake out of the chamber when the plates are separated. A filtrate exit port 44 is attached to the lower plate 38 for conducting the liquids separated from the slurry to selected locations as will be described later.

The filter apparatus is controlled in its operations by the controller 16 which includes controls for the plate movement apparatus 46, such as hydraulically operated equipment employed in opening and closing the plates 36 and 38, and the filter media movement apparatus 48 for moving the filter media when the plates are separated. The controller 16 also controls the operation of input streams of several liquids or fluids here shown as "liquid clear" or cake forming gas at 50, steam at 52, and drying or conditioning gas at 54. These and possibly other sources of input to the filter chamber are passed into the chamber through a suitable valve means 56 and into input port 58 when the chamber is closed. It should be understood that one or more of the gases may serve as one or more of the liquid clearing or cake forming gas, steam or drying or conditioning gas. These inputs may be introduced by separate input ports as at 58 or may be introduced through a single input port 34 with suitable valving means.

Incorporated into this description are the details of the filter apparatus construction as shown and described in my prior U.S. patents 5059318, 5292434, 5462677,5477891, 5510025, 5573667, 5615713, 6159359, 6491817 and 6521135; the disclosures of which are incorporated herein by reference. In certain of those patents multiple filter apparatus stacked above each other are disclosed as well as shallow chamber filter apparatus that is used in accomplishing filtration of difficult to filter slurry streams.

An objective of the system and apparatus of the present invention is to treat slurries in a pressure filter for the extraction of liquid and creating a completely or substantially dry filter cake. In some slurry treatment process it is the extraction of liquid or effluent that is desired and in others it is the filter cake that is desired. In either case it is the ability of the pressure filter and its operation that controls the production of the desired product. It is the conditioning of the slurry and the treatment of the cake within the filter that determines the success of the separation operation. The creation of the filter cake within the filter can be dependent on pretreatment operations on the slurry as well as distribution and operations

within the pressure filter. The present invention is directed to those operations in treating a slurry stream to produce a desired result.

While many filtering operations are committed to known slurry streams, some streams can vary in many aspects. As a first step used in the present system 10, a slurry stream 12 is first passed through an analytical step for determining such characteristics of the slurry as its pH, temperature, pressure, viscosity and the like. That analysis is accomplished in the analytical equipment 14.

Based on the analysis of the slurry stream and the desired end product that is to be produced, the slurry stream is then subjected to a series of treatment processes all under the control of a controller 16. One such process is the adjustment of the pH in pH adjuster 20 where a desired pH can be established by adding suitable chemicals.

A next possible treatment step is the addition of coagulants to the slurry stream from the coagulant source 22. Coagulants can be added to the slurry stream to selectively prepare certain portions of the slurry stream prior to entry into the filter chamber. The selection of a coagulant will be process selective and selected to accomplish a desired quality in the slurry stream.

A next possible addition to the slurry stream is the addition of polymers that cause the slurry to be in a desired condition for filtration. In the process shown in FIG 1, there are shown two sources of polymers; polymer A at 24 and polymer B at 26. Polymers added to a slurry stream can selectively collect certain materials in the slurry stream and hold those materials in a form that will be more easily separated from the liquids of the stream.

Each of the treatment and additive possibilities is under the control of the controller 16 that may have been preprogrammed to accomplish a desired condition for the slurry stream. Between each of the additive stages, inline mixers 27a, 27b, 27c, and 27d can be provided to assure that the treatment or additive has been adequately mixed into the slurry stream to accomplish the desired condition.

The treated slurry stream is then fed to a slurry conditioning stage 28 in the form of a suitable hopper or container including a mixer 30 for establishing the desired mixing and conditioning of the slurry stream for transportation to the filter chamber of the filter apparatus 32 as shown in FIG 2.

The filter apparatus 32 is described in my issued patents listed above and includes at least one pair of separable plates, upper plate 36 and lower plate 38 that have mating cavities for the formation of a filter chamber 40 when the plates are pressed against each other. The upper portion of the chamber 40 is adapted to accept input slurry at slurry input port 34 and to distribute the slurry uniformly within the chamber. The size of the chamber in volume is determined by the characteristics of the slurry being treated and is sometimes very shallow, ½ inch to 2 inch, to provide for uniform distribution or may be of greater vertical dimension, 6 to 8 inches, for slurries that are easily distributed. The distribution of the slurry within the chamber and the effect of even distribution will be described further hereinafter. Below the chamber 40 and above the lower plate 38, a filter media 42 is positioned for the collection of the solids from the slurry while the liquids are passed through the filter media and into the lower plate for discharge at port 44 from the filter apparatus 32. The filter media 42 is supported within the chamber by suitable means and is sealed by the edges of the upper and lower plates as they are mated to form the chamber. The mating of the plates forming the chamber and the sealing of the filter media is at elevated pressure so that the interior of the chamber can be subjected to pressures as high as 400 psi when applicable. The plates can be constructed of suitable material to be able to be subjected to high temperatures and pressures as applicable during the operation of the filter apparatus. Such material can be metals or plastics that can withstand sustained exposure to the temperatures and pressures applied to the apparatus.

After a controlled amount of slurry has been introduced into the formed chamber through valve 57 and properly distributed throughout the chamber, the interior of the

chamber is subjected to a controlled series of introductions through a valve 56 and suitable input port 58. This input port may be the same port as the slurry input port 34 with suitable isolating valving. The input port carries liquid clear or cake forming gas from the source 50, or steam from source 52, or drying or conditioning gas from source 54. The timing and duration of the input of these materials is under the control of controller 16 and in accord with a suitable program.

The introduction of gas, steam or conditioning gas is intended to extract the free liquids from the slurry as effluent or filtrate and the filter chamber is designed to pass those extracted fluids through the lower plate to the filtrate exit port 44. The extraction of liquids from the slurry forms a cake of solids within the chamber in varying degrees of dryness as the liquids are extracted as filtrate. To further treat the formed cake and to increase its dryness, an initial input of "liquid clear" or cake forming gas which draws a first amount of the liquids from the slurry, that gas may be at ambient temperature or at elevated temperature in accord with an analysis of the slurry to be treated an in accord with the temperature that the slurry can withstand. The system is also adapted to introduce steam to the chamber to continue the extraction of liquids from the formed cake. The chamber can also have drying or conditioning gas introduced through port 58 to continue the treatment of the cake prior to withdrawal from the chamber. Each of the foregoing steps and introductions are under the control of he controller 16.

After the filtrate has been extracted and the cake has been treated to attain the desired dryness or condition, the chamber is opened and the filter media moving apparatus is operated to move the filter media belt out of the chamber for discharge of the cake to a suitable container. The filter media is then cleaned for reuse and reentry to the chamber or another segment of filter media is transported into the filter into alignment with the upper and lower plates. This system may also be used with disposable media as well as recleanable filter media. The plates can then be closed and the process of treating another

input of slurry may begin. These cycles are continued in repeating cycles.

In accord with the present invention, a system and apparatus is disclosed for preparing a slurry for separation into filtrate and solids. It has been found that the introduction of coagulants and polymers to a slurry can assist in the formation of a cake within the filter chamber that will permit more effective exposure of the cake to the introduction of wash liquids and other gases. This improvement in the formation of the filter cake materially assists in the extraction of liquids from the cake and the formation of a drier resultant filter cake. The coagulants assist in the formation of paths through the cake for the passage of liquids and gases in the extraction process. The polymers also assist in the formation of these extraction processes. The interior of the filter chamber may include sensing elements for determining the pressure, temperature and dryness of the formed and treated cake.

The introduction of gases, liquids and steam has been found to assist in the formation of a desired filter cake. The introduction of hot gas has been found to increase the efficiency of extraction of liquids from the cake. The hot gas can be heated from heat exchangers associated with the filter apparatus or from peripheral equipment in a manufacturing process, shown in FIG 2 as heat recycle, thus improving the efficiency of the overall process.

The use of superheated steam has also been shown to assist in the extraction of liquids from a filter cake if the steam can be kept above its condensation point in the liquid/vapor condition of the steam. Steam while in its gas phase and above its condensation temperature or pressure will extract liquid from the cake. Because the filter chamber of the present filter apparatus can be maintained at elevated pressure and elevated temperature, the use of superheated steam can be used in the present system.

The temperature of the filter chamber can be varied during the filtration process to accomplish certain desired results. For example, when the filter cake is initially formed from

the slurry, the introduction of steam may initially condense some liquid from the steam before the cake and/or chamber rises in temperature to be above the condensation temperature. That condensed liquid then assists in washing the cake and carrying liquids out as filtrate. When the temperature of the cake is above the condensation temperature, the steam then further dries the cake as it passes through the cake. After the use of high temperature steam the chamber may need to be cooled before the cake is removed in preparation for the next filtration cycle. The introduction of drying or conditioning gas is used for that purpose.

It should be understood that there will need to be suitable valving means at the filtrate exit port 44 to direct the desired filtrate from the chamber to its destination. If the desired product from the filtration process is a dry filter cake, the filtrate can be recycled or treated to other uses and the cake can be discharged to further processes. The fluids extracted from the slurry as filtrate may have several uses dependent upon the characteristics of the fluid being extracted. For example, the first extracted fluid may be used for one purpose while the later extracted fluid may have a different use.

Due to the lower temperature threshold for operations of the filter apparatus versus the temperatures incurred in conventional heated drying equipment, the creation of volatile organic compounds (VOC) is reduced or possibly even eliminated

The methods for pretreatment of the slurry with coagulants or polymers is intended to prepare the slurry for the creation of an initial slurry formation that will expedite the extraction of liquids from the cake. The pretreatment processes cause the cake to have more permeability and to have interstices that allow the passage of drying gasses through the cake and thus assist in the creation of a drier filter cake. The reduction in time and the reduction of volume of treating liquids or gases increases the efficiency of the pressure filter and the economics of the system and apparatus. The elimination of peripheral equipment that have in the past been needed to further treat or dry a filter cake reduces the space requirements for a filter system and reduces the utility requirements for operation of the

system. Whether it is the filtrate or the dried cake that is the product to be derived from the treatment of a slurry, the present system produces such products in shorter time and with less operating costs than other known available systems.

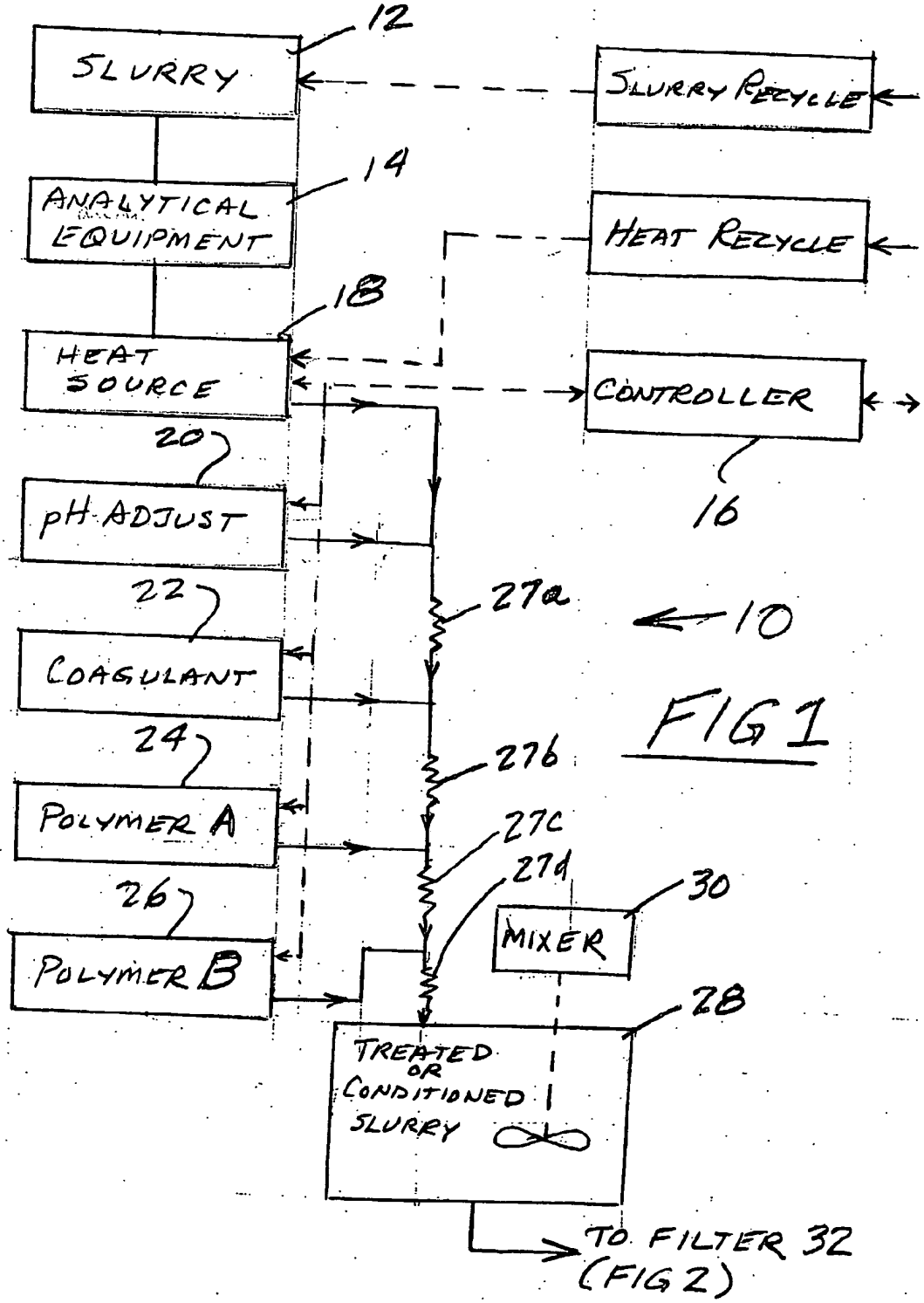
12
SLURRY
SLURRY RECYCLE
14
ANALYTICAL EQUIPMENT
HEAT RECYCLE
18
HEAT SOURCE
CONTROLLER
16
20
pH ADJUST
22
COAGULANT
27a
10
24
POLYMER A
27b
27c
27d
26
POLYMER B
30
MIXER
28
TREATED OR CONDITIONED SLURRY
TO FILTER 32 (FIG 2)

FIG 1

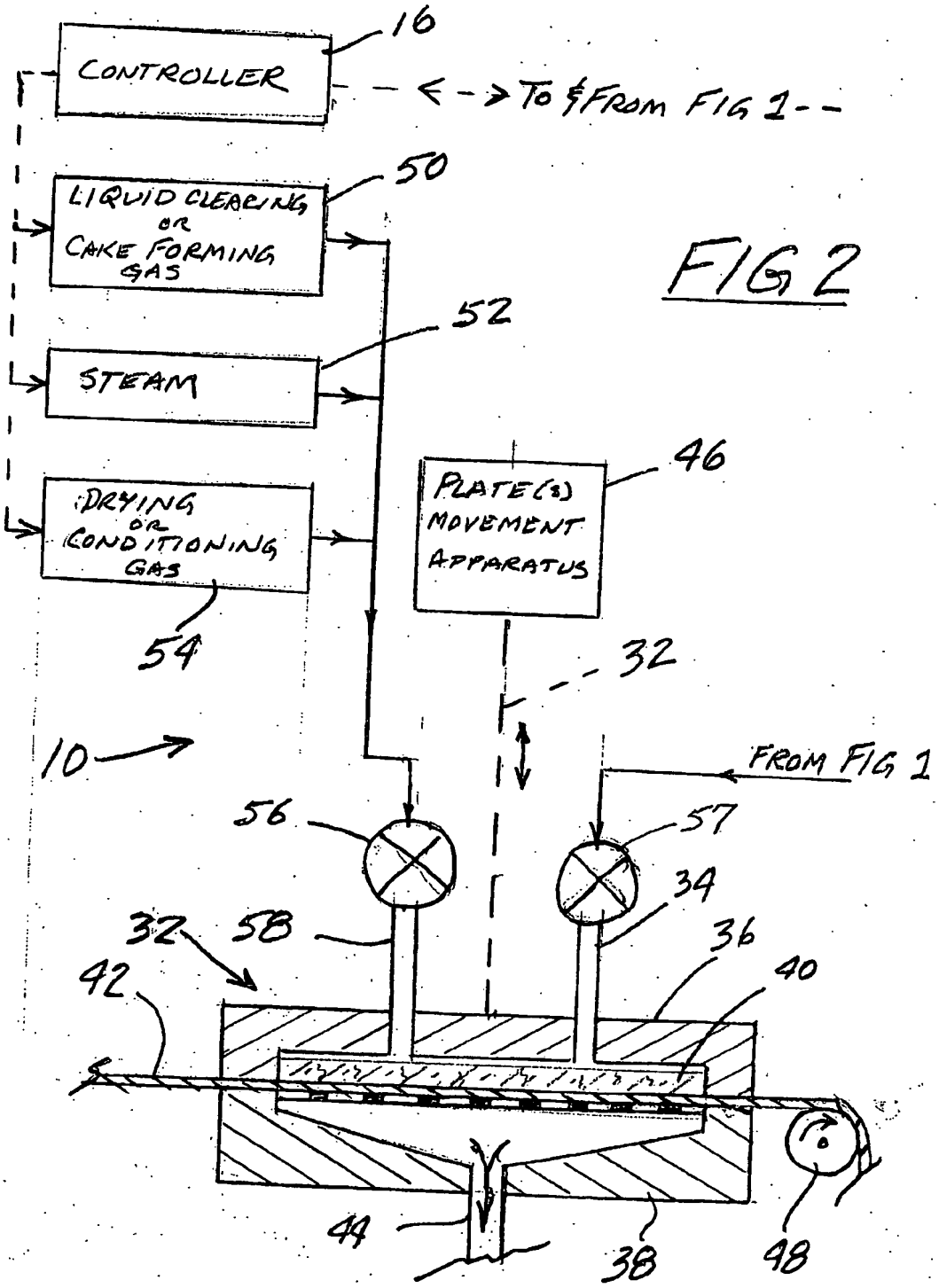
16
CONTROLLER
<-> TO & FROM FIG 1
50
LIQUID CLEARING OR CAKE FORMING GAS
52
STEAM
46
PLATE(S) MOVEMENT APPARATUS
DRYING OR CONDITIONING GAS
54
32
10
FROM FIG 1
56
57
34
32
58
36
40
42
44
38
48

FIG 2

Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/US04/018644

International filing date: 12 June 2004 (12.06.2004)

Document type: Certified copy of priority document

Document details: Country/Office: US
Number: 60/478,791
Filing date: 16 June 2003 (16.06.2003)

Date of receipt at the International Bureau: 16 September 2004 (16.09.2004)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)

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